Program: B.Tech in Mechanical Engineering   Academic Year: 2022   Duration: 3 hours

Date: 09.01.2023
Time: 10:30 am to 01:30 pm
Subject: Machine Design II (Semester VII)   Marks: 75

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

(1) This question paper contains 02 pages.
(2) **All Questions are Compulsory.**
(3) All questions carry equal marks.
(4) **Answer to each new question is to be started on a fresh page.**
(5) **Figures in the brackets on the right indicate full marks.**
(6) **Assume suitable data wherever required, but justify it.**
(7) **Use of PSG Design Data book is allowed.**
   Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	i)A pair of Helical gear is used for transmitting 36.8 KW power at 30 r.p.s of pinion. The gear ratio is 4. The tooth system is 20Deg. full depth involute. The helix angle is 15Deg. If Gear pair is made of steel C50, design gear pair for Strength and Wear condition. **OR** ii)Design the bevel gear pair for the following specification using Barth factor and wear conditions: Power Transmitted = 40 kW, Input speed= 360 rpm, Reduction ratio=3, Shaft angle=90 Deg. Application = Agitator	[10] [10]
Q1 (b)	Derive Levis Beam Strength Equation.	[05]
Q2 (a)	A DGBB SKF No. 6208 is subjected to the following work cycle. <table><tr><td>Work Element</td><td>Radial Load (N)</td><td>Thrust Load (N)</td><td>Speed (r.p.m)</td><td>%Time Engaged</td></tr><tr><td>1</td><td>3000</td><td>1000</td><td>600</td><td>15</td></tr><tr><td>2</td><td>3500</td><td>1000</td><td>800</td><td>20</td></tr><tr><td>3</td><td>5000</td><td>100</td><td>900</td><td>30</td></tr><tr><td>4</td><td>500</td><td>2000</td><td>1500</td><td>35</td></tr></table>If the service factor is 1.2, determine the expected life of the bearing in hours with probability of survival of 90%.	[10]
Q2 (b)	i)With neat sketch explain force analysis of Spur Gear. OR ii)Explain different types of gear tooth failures.	[05] [05]
Q3 (a)	A full journal bearing is used for supporting a load of 7 KN at 500 r.p.m for machine tool application. Selecting fit of $H_9 e_9$ and l/d ratio of 1, determine; 1.Bearing dimensions 2.Sommerfeld number 3.Minimum film thickness 4.Coefficent of friction	[10]

	(Assume Average Clearance and bearing Pressure 1.5 N/mm^2)	
Q3 (b)	i)Discuss advantages and disadvantages of rolling contact bearing over sliding contact bearings. **OR** ii)How various factors influence the life of Bearing?	[05] [05]
Q4 (a)	i)A Rotary disc cam with central translatery roller follower has following motion: Forward Stroke of 25mm in 120 Deg. of cam rotation with SHM motion dwell of 60 Deg. of cam rotation and return stroke of 25mm in 100Deg.of cam rotation with SHM. Remaining dwell to complete the cycle. Mass of the follower is 1 kg and cam shaft speed is 600rpm.The Maximum Pressure angle during forward stroke and return stroke is limited to 25Deg. The external force during forward stroke is 300 N and that of return stroke is 50N. 1.Find Prime circle radius, Base circle radius. 2.Calculate radius of curvature of pitch curve and cam profile Determine the width of cam. **OR** ii)A chain derive is to be used to transmit 5 kW power from an electric motor running at 1000 rpm to a machine running at 500 rpm. The service condition involves light shock. 1.Select a standard roller chain 2. Determine the pitch circle diameter of driving and driven sprocket 3.Determine length of chain 4.Specify the correct center distance between the axis of sprocket.	[10] [10]
Q4 (b)	Define Pressure angle and explain its significance in the design of cam.	[05]
Q5 (a)	i)A multiple disc clutch, steel on bronze, is to transmit 8KW at 800 rpm. The inner radius of contact is 40 mm and outer radius of contact is 70mm. The clutch operates in oil with an expected coefficient of friction of 0.1. The average allowable pressure is 0.5N/mm^2. Determine 1.The total Number of steel and bronze discs 2.The actual axial force required 3.The actual Maximum Pressure **OR** ii)The turning moment diagram for a multi-cylinder engine has been drawn to a scale 1 mm= 600 N-m vertically and 1 mm = 3° horizontally. The intercepted areas between the output torque curve and the mean resistance line, taken in order from one end, are as follows: + 52, – 124, + 92, – 140, + 85, – 72 and + 107 mm2, when the engine is running at a speed of 600r.p.m. If the total fluctuation of speed is not to exceed ± 1.5% of the mean, find the necessary mass of the flywheel of radius 0.5 m.	[09] [09]
Q5 (b)	A horizontal cross compound steam engine develops 300 kW at 90 r.p.m. The coefficient of fluctuation of energy as found from the turning moment diagram is to be 0.1 and the fluctuation of speed is to be kept within ± 0.5% of the mean speed. Find the weight of the flywheel required, if the radius of gyration is 2 meters.	[06]